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ABSTRACT

Four papers detailing the Fuller Reading System and its successful use with low-IQ subjects and one paper discussing the System and the results of using it are presented in this collection. The subjects were 23 residents of Maryland's principal institution for the retarded. They ranged in age from eleven to 51 years and in Stanford-Binet IQ from 33 to 72. Daily five-to-twenty-minute teaching sessions for one year resulted in all subjects being able to read at the third grade level as measured by the Spache readability formula. The Fuller Reading System consists of simplified alphabet learning based on the distinctive features of each letter; the most common phonic sound as the name for each letter; an auditory, visual, kinesthetic, and tactile approach; and action-oriented space oddysseys as reading content. Dr. Fuller poses a number of questions about what intelligence is and the high positive correlation between IQ measures and predictability of school performance. The discussant, Dr. Sam Glucksberg, also questions the accepted relationship between measured intelligence and reading comprehension, citing prominent twentieth century research on several sides of the issue. (TO)

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SYMPOSIUM

READING COMPREHENSION AND INTELLIGENCE:

A FALLACIOUS CORRELATION ?

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Presented at the 80th Annual Meeting of the American Psychological Association, Honolulu, Hawaii. September 6, 1972

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Dr. Judy F. Rosenblith, MODERATOR, is A. Howard Meneely Professor of Psychology, Wheaton College, and Member, Institute for Life Sciences, Brown University. She received her A. B. at University of California, Los Angeles; M.A. in 1950 and Ph. D. in 1958 at Harvard University. Dr. Rosenblith is a Fellow of Divisions 7 and 9 of the American Psychological Association; Past Secretary of the Society for Research in Child Development; former Member of the Board of Directors, Massachusetts Psychological Association; and the Senior Editor of three books: The Causes of Behavior: Readings in Child Development (Allyn and Bacon, Boston, 1962, 1966, 1972); Readings in Child Development: Causes of Behavior (in press); and Readings in Educational Psychology: Causes of Behavior (in press).

Dr. Sam Glucksberg, DISCUSSANT, is Professor of Psychology at Princeton University. He received his B. S. in 1956, City College of the University of New York, and his Ph. D. in 1960, New York University. Dr. Glucksberg is on the editorial Board of Child Development, and Cognitive Psychology, and has published numerous articles in the fields of Cognitive and Linguistic development, Memory, and Problem-solving.

INTRODUCTION TO SYMPOSIUM

Judy F. Rosenblith, Ph.D.

It was a pleasure to be asked to chair a meeting presenting the results of Dr. Fuller and her colleagues with her exciting new system of teaching reading. I feel well qualified to say it is exciting since I have had the opportunity of watching several of the subjects during their lessons and have seen their enthusiasm as they were able to sound out the words of the new text, find out what happened next, and answer questions about the meaning of what they had just read. This produces excitement in the viewer when one knows the diagnostic work up on the subject shows no previous reading and an IQ of 33.

One of the outstanding aspects of the Fuller Reading System is that it has successfully involved people in various stages of their professional development. Even non-professionals such as secretaries have been used to teach the System.

The first paper, "The Fuller Reading System: A Scientific Method of Teaching for Those Who are Ready or Not," will be presented by Mrs. Judith Schmell. Mrs. Schmell received her B.A. from Stern College of Yeshiva University and is currently working on an M.A. in Psychology at Loyola University. She is a Research Analyst in the Perceptual and Cognitive Laboratory of the Psychology Department, Rosewood State Hospital, Owings Mills, Maryland.

There will be two Results papers on teaching the Fuller Reading System. The first part will be presented by Elizabeth J. Noyes. Miss Noyes received her B.A. at Converse College and M.A. at University of

Virginia, 1971, in Experimental Psychology. She is presently a Psychologist in the Perceptual and Cognitive Laboratory at Rosewood State Hospital.

The second Results section will be presented by Joyce B. Shuman. Mrs. Shuman was graduated cum laude from Bryn Mawr College and expects to receive an M.S. as a Reading Specialist from Johns Hopkins University in 1973. She was formerly a first grade teacher and has been a Research Analyst in the Perceptual and Cognitive Laboratory of the Psychology Department at Rosewood State Hospital for five years.

The final paper, "A New Theory of Intelligence Which Allows Reading with Comprehension in Low IQ Subjects", will be presented by Dr. Renée Fuller, the author of the new Reading System. Dr. Fuller received her Ph.D. in 1963 from New York University. In her present capacity as Chief of Psychological Services at Rosewood State Hospital (Maryland's principle institution for the retarded), Dr. Fuller has organized a department concerned with the problems of Perception and Cognitive development. She has published extensively in the field of Behavior Genetics. Clinical research findings in that field led her to utilize knowledge from developmental and perceptual psychology for the field of learning. The development of the new method began 13 years ago when Dr. Fuller started her work with children. At present, there are 12 books in the system, and another 7 are projected.

THE FULLER READING SYSTEM: A SCIENTIFIC METHOD OF TEACHING FOR THOSE WHO ARE READY OR NOT *

Judith A. Schmell

Although the Fuller reading system was developed for the normal and superior child, we have found it a successful remedial system with various types of learning disorders. The next two papers will deal with data resulting from teaching the system to retarded subjects with severe learning disorders. The present paper is a description of the system, and may give indications as to why it was successful with low IQ subjects.

The new reading system is innovative and simplifies the mechanics of the reading process. The innovations begin with the alphabet. For many normal children, the alphabet configuration is a perceptually difficult discrimination. The work of Gibson and Pick at Cornell has shown that alphabet discrimination is developmentally late in evolving. Many of the discriminations are ones that normal children have difficulty making before the age of 7 or 8. In the new system, the alphabet is taught on the basis of "distinctive features". The distinctiveness of each letter is established by showing how it can be composed using three basic forms. The three basic forms are a line, a circle, and an angle. Supportive experimental evidence for utilizing these three basic forms in alphabet discrimination can be found in the work of Kuennepas. In analyzing the alphabet, Kuennepas found that three

*This paper is part of a symposium "Reading Comprehension and IQ: A Fallacious Correlation?" presented at the American Psychological Association, September 6, Honolulu.

factors, rectangularity, verticle linearity, and roundness, aid in the visual perception and memory of letters. These three factors have been utilized to teach the child the "distinctive features" of each letter of the alphabet. In addition, the three basic forms are developmentally discriminable at a much earlier age than the usual alphabet configurations. The work of Gesell and others has shown that even a two year old can discriminate and manipulate a triangle, a circle, and a square. By using the similar but even simpler line, circle, and angle as building blocks, letters cease to be mysterious hieroglyphs and become familiar objects. To further facilitate initial letter discrimination, and to attract the learner's attention to the "distinctive features", the three basic forms are color coded. The child is shown how to make the letter with color oded forms. On the same page, he is then immediately shown how the same letter looks in the standard printed black. We have found that the transfer from color coding to print is an easy and immediate transfer.

In the present system, the child is taught the alphabet through four sense modalities. These are auditory and visual, as well as tactile and kinesthetic. The child manipulates the component parts to form a letter, then hears and says the phonic sound of the letter that has been visually presented. By using these four sense modalities, more than one modality of learning is utilized. In this way, we seek to load the dice by utilizing the child's greatest potential. This permits strengths in one area to compensate for deficits in another.

The next innovation of the system is that letters are taught in a sequence that is based on developmental and perceptual psychology.

The most easily built and simple letters appear first. Letters useful in word building come early in the new alphabet order. This is important, because in this system alphabet learning is immediately utilized in word formation and story reading. Other factors that determine the order of alphabet presentation are: letters that either sound very similar or look very similar are not learned in close succession. This is done to avoid auditory and visual retroactive and proactive inhibition. In order to reduce the memory load, the two pairs of letters (E and Y, C and K) that have the same sounds are presented contiguously.

The reading system seeks to lower the initial memory load to facilitate concentration on the reading process. For this reason, letters are called by their most usual sound, rather than by their useless alphabet names. In this way, 26 rather than 52 associations have to be learned. Regular sounds are taught first; other sounds and combinations are introduced subsequently. Emphasis is on establishing a flexible attitude toward sounding out words. This is one of the most important facets of the system. The child is taught "code approximation". He is taught that there will not be a 1:1 correspondence between letter and sound. He is taught that letters may indicate what a word will be, but that he cannot be sure of what the word is, except in the context of a sentence or a paragraph. What is amazing is that so non-rigid a system, that requires so much judgment, should prove effective with low IQ students.

The memory load is further reduced by teaching reading in standardized capitals. After the student has been shown how to make a letter with the color coded forms, he is immediately shown the same letter in regular black capitals. It is with these regular black capitals that the student reads after learning the second letter. Learning to read with 26 capital letters, rather than capital and lower case letters in print and cursive, making 104 configurations, makes the beginning task very much easier. Only after the child is reading fluently, after his tenth book, is lower case introduced.

This reading system has been found to be successful in presenting high level verbal material early in the reading process. Some of the reasons for this may be: (1) Word forming begins with the learning of the second letter, (2) Stories begin after the fourth letter has been introduced, (3) The nature of the stories (action oriented space odysseys). In this way, what has been learned is immediately utilized and anchored through context. That which initially began as nonsense material becomes immediately structured through context, reducing the probability of forgetting.

The stories that start with the fourth letter are not only action-packed space odysseys, but they are arranged to be cliff hangers. In order to find out what happens next, the reader must learn a new letter or reading principle. No formal drill is used, but repetition appears in the context of stories. Thus the reading process is always fun; and there are immediate payoffs for learning. The payoffs are entertainment.

It has become apparent that there is something intrinsic to the stories that has tremendous motivational value. The stories, with their vast array of imaginary characters, are wildly constructed action packed episodes. They are pusposely written on several different levels of sophistication, so that the humor appeals not only to children, but also to adults. For it is the adult who is the teacher.

The books are different from standard first readers in another way. The following table shows results from rating the Fuller reading books using two of the formulas most used for rating the various elementary school books.

Readability Formulas

(From Random Sample of Text)

BOOK	SPACHE	FLESCH
	% new words sentence length	Sentence length # of syllables
1	2.2 grade	early-er 4th grade
2	2.7 grade	early 4th grade
3	3.0 grade	late 5th grade
4	3.1 grade	early-er 5th grade
5	3.3 grade	early 5th grade

We have an interesting paradox within the system. Although the mechanics of the reading process have brought the system down to a lower level of development, the content, evaluated by the readability formulas, has been brought to a higher developmental

level than is usual in beginning readers. The effectiveness of this technique, even on subjects with severe learning disorders, will be discussed in the next two papers.

The film that follows is a visual presentation of the main aspects of the new system. *

Film (16 mm color, sound, 15 minutes)

* The Fuller Reading System books are copyrighted under the name of Renee Fuller, with patent pending for the alphabet innovations.

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BRIEF REVIEW OF THE FULLER READING SYSTEM

1. Alphabet learning is simplified. The student is shown how each letter can be made, using three basic forms. The basic forms are a line, a circle, and an angle; called by the happy names of a stick, a ball, and a bird. Because these forms are familiar to even the very young child, alphabet discrimination is brought to an earlier level of development.
2. Letters are taught on the basis of "distinctive features". The distinctiveness of each letter is established by showing how it can be made with the three basic forms. Color coding of the basic forms makes the "distinctive features" stand out clearly.
3. The child is taught the alphabet through four sense modalities. These are auditory, visual, tactile, and kinesthetic. In this way, strengths in one area can compensate for deficits in another.
4. The letters are taught in a non-alphabetic sequence. (a) The simplest letters are presented first. (b) Letters useful in word building come early in the alphabet order. (c) Letters that either sound or look very similar are spaced apart. (d) The two pairs of letters, (C & K, and I & Y) that have identical sounds are presented contiguously.
5. Letters are called by their most usual phonic sound, rather than by their useless alphabet name.
6. Alphabet learning is immediately anchored through use of word formation, which begins after the second letter has been learned. Stories begin after the introduction of the fourth letter.

7. The child is taught 'code approximation'. He is taught that the phonic sounds of letters may indicate what a word will be, but that he cannot be sure of what the word is, except in the content of a sentence or a paragraph.

8. Reading is taught in standardized capitals. Only after the child is reading fluently, is lower case introduced.

9. The action-oriented space odysseys are arranged as cliff-hangers. In order to find out what happens next, the student must learn a new letter or reading principle.

10. In the Fuller System, the mechanics of reading have been brought to a lower developmental level, while content and vocabulary are more advanced than the usual beginning readers.

RESULTS FROM TEACHING THE FULLER READING SYSTEM TO THOSE WITH LOW COMPREHENSION EXPECTATION *

PART 1

Elizabeth J. Noyes

The subjects were 23 residents from Maryland's principle institution for the retarded. Eighteen subjects were male, 5 were female; 10 were black, 13 white. Their Stanford-Binet IQs (Form L-M) ranged from 33 to 72. Their CAs ranged from 11 to 51 years.

The medical diagnosis of the 23 subjects is as follows:

N=3 "Chronic brain syndrome".

N=2 Mental retardation, with structural manifestations; etiology unknown.

N=2 Mongoloid.

N=1 Microcephalic.

N=1 Post-encephalitis.

N=1 Undifferentiated late effects of polio myelitis.

N=1 Spastic quadriplegic; encephalopathy, due to uncertain cause with structural reaction.

N=8 Cultural-familial mental retardation.

N=1 Cultural-familial retardation with schizoid manifestations.

N=3 Mental retardation with schizophrenia.

*This paper is part of a symposium "Reading Comprehension and IQ: A Fallacious Correlation?" presented at the American Psychological Association, September 6, Honolulu.

The subjects were selected on the basis of past reading failure. School records showed that they had been exposed to a multitude of reading systems, both in special classes and with individual teachers, yet no subjects had achieved mastery of even the alphabet. Results from the Wide Range Achievement Test confirmed the subjects' minimal reading achievement. Because all the subjects represent such acute learning disorders and had failed to learn even the alphabet using a multitude of reading systems, both individual and in groups, the subjects could serve as their own control. This would be similar to testing out an anti-cancer drug on terminal cancer patients.

Another factor involved in the selection of subjects for the reading program was that they represented various types of acute learning disorders. A rough breakdown of the types of problems shows:

N=4 Verbal associational deficit - problems with structured, verbal material (IQ = 35, 47, 51, 62).

N=1 Visual and auditory memory deficit for unstructured material (IQ = 48).

N=1 Aphasia - graphic (IQ = 62).

N=7 Intelligence deficit - no patterning (IQ = 33, 34, 35, 35, 35, 36, 63).

N=3 Schizophrenia - disorganized test pattern (IQ = 53, 59, 67).

N=2 Schizophrenia, plus visual and auditory memory deficit (IQ = 46, 51).

N=4 Motivational problems (IQ = 64, 64, 68, 72).

N=1 Motivational, plus verbal associational deficit (IQ = 60).

Subjects were taught to read using the Fuller Reading System described in the preceding paper. Teaching sessions were daily, lasting from 5 to 20 minutes, and were individual. The teachers, who ranged from professional psychologists to secretaries, were randomly assigned to various subjects each day. This was done to minimize the teacher variable, so that the results measured would reflect the effects of the new system.

After being taught for one year on the Fuller Reading System, the subjects were able to read books on the third grade level. Grade level was determined by both the order of the reading books in the Fuller System, and the Spache readability formula described earlier. When other standard readability formulas were used, the books read after one year were graded as fourth or fifth grade level.

A variety of evaluative techniques were used to test the subjects' mastery of the mechanics of reading, as well as their comprehension of the high-level stories. This paper will deal with results from the following tests. The reading of:

1. Word lists (out of context).
2. The same words as above in context (sentence reading).
3. Reading inventory (passage reading).

The subsequent paper will deal with results from:

4. Daily rating sheets.
5. Vocabulary tests (definitions).
6. IQ tests (Stanford-Binet).

Results from only the first 5 books will be presented. Results from the later books will be dealt with in future papers.

Most books, with the exception of the first two, were read more than once by our subjects. Post and usually pretests were given before and after each reading. In our data, we present the first recorded pretest and the most recent posttest. The reasoning for using the second or even later posttest scores, rather than the first, arises out of design. The books were put together with the intent of being read several times. Because of their length (160-200 pages) learning through memorization is impossible. The stories are written on several levels so that repeated reading allows not only the learning of reading principles, but also greater emotional understanding. The eagerness with which the subjects reread books is an indication of the success of the design. The present papers are trying to show final learning. The learning curves for various subjects will be dealt with in more detailed papers. Because all the tests had not been developed when the study began, a few subjects are missing the first pretest. In that case, the second pretest was used, thereby biasing the results against the system.

The word list tests were given before and after the reading of each book in the System. The lists of 10 to 15 words were of two types: (1) Words from the Fuller System books; (2) Words from comparable level "Dick and Jane" books, equated for length with the Fuller books. Here, as examples, are both lists from Book 2:

Slide

Fuller Words	"Dick and Jane" Words
NO	UP
HE	WE
MUST	FAST
FAT	TIM
SACK	WENT
PLANET	KITTEN
LETTER	RABBIT
SPIN	DUCK
BUMPY	FARM
MAN	RAN
POP	HEN
KICK	JACK
RING	PIGS
BACK	BARN
HOT	HOP

Word list results are shown in Figure 1.

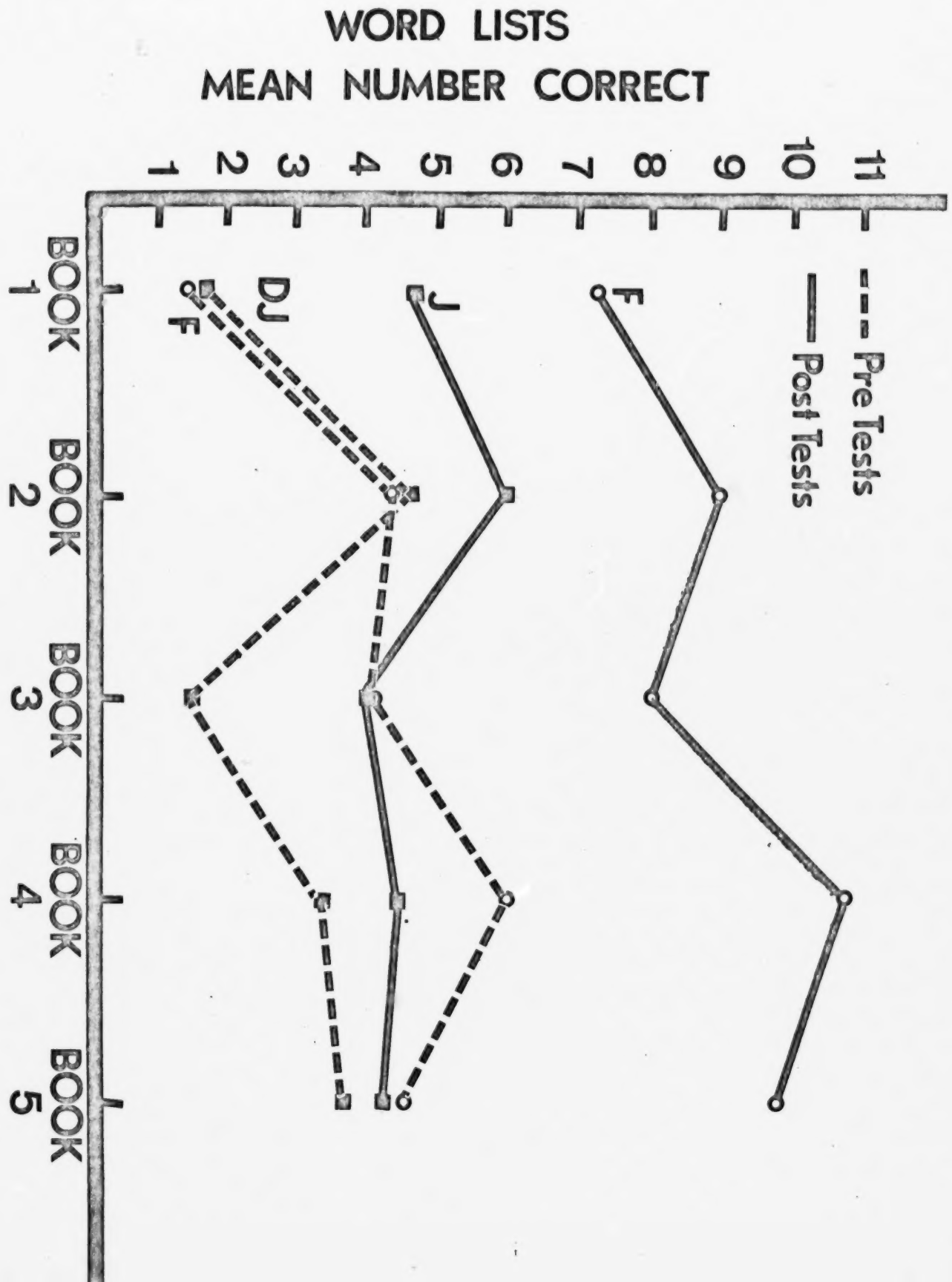
Slide (See Figure 1)

It is apparent from Figure 1 that posttests of the Fuller word lists were significantly better than pretests. Results for the five books (in order) were: ($t = 6.13$ $p < .0001$; $t = 2.36$ $p < .025$; $t = 2.28$ $p < .025$; $t = 2.54$ $p < .01$; $t = 2.73$ $p < .01$).

On Dick and Jane word lists, there is also a positive improvement from pre to posttests, which, however, is significant only for the first list ($t = 1.82$, $p < .05$). The significant improvement on the first Dick and Jane word list reflects the increasing ability to sound out unfamiliar words. It is a good measure of the transfer value of what has been learned. Subjects learn the sounding out game in Book 1.

The next measure of reading accomplishment compares words read

Figure 1


WORD LISTS
MEAN NUMBER CORRECT
1
2
3
4
5
6
7
8
9
10
11
BOOK 1
BOOK 2
BOOK 3
BOOK 4
BOOK 5
DJ
F
J
F
--- Pre Tests
—— Post Tests

out of context with the same words read in the context of sentences. The sentences are similar to those found in the books. Here is the word list from Book 4.

Slide

HOW
QUICK
STEEL
HELPS
FISH
AFTER
THINKS
CLEVER
COOL
PAY
NAME
WEEDS
ANTENNA
SPACE
SUN

The same words embedded in sentences:

Slide

MIMI SAYS: "HOW CAN WE HELP THE FISH?"

VAD SAYS: "QUICK, WE MUST GET TRUNKS OF STEEL".

VAD HELPS THE FISH.

TIMO TAGS AFTER THEM.

HAPPY CAT DICK THINKS UP A CLEVER PLAN. HE IS A COOL CAT.

TIMO'S PAYOFF IS A NAME.

GREEDY WEEDS IN THE PONDS OF PLUTO.

A VOODOOS ANTENNA GOES SSSS.

VOODOOS ZAPPED VAD IN SPACE.

IN SUN VOODOOS GO PUFF.

The underlined words are the same words as those on the word lists. Underlining does not exist in the copy given the students.

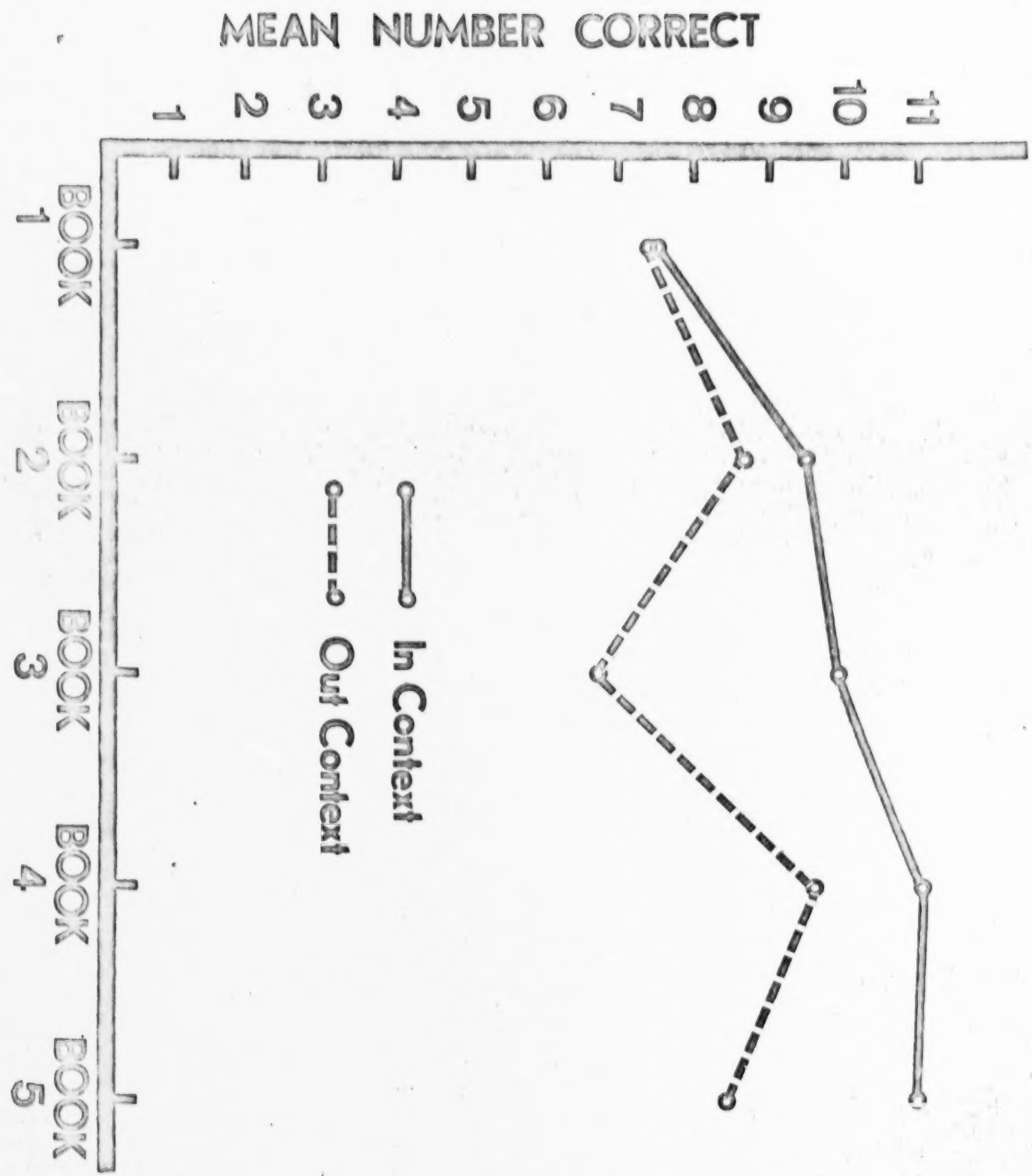
Methodologically, reading words in context can serve as a non-frightening test of the use of meaning. It can act as an indirect way of testing how much the subject understands.

Slide (See Figure 2)

For the first book, there was essentially no difference between words read in isolation and those read in context. However, with the second book, there was a significant difference ($t = 1.92$, $p < .05$) between the same words read in a list and those embedded in a sentence. The difference between in and out of context for the remaining books reached even higher levels of significance ($t = 5.08$, $p < .001$; $t = 3.26$, $p < .01$; $t = 2.74$, $p < .025$). The subjects had learned to use context. The successful use of context by learners with IQs in the low 30s is unexpected. The usual conceptualization of intelligence expects a high correlation between the use of contextual cues and IQ. But even for very low IQs, reading becomes an easier task when words are embedded in meaningful material, as is done in the Fuller System, than when words are presented in isolation.

The next measure, Reading Inventory, shows the success of our subjects in reading whole passages. It is a further measure of contextual reading, and was administered before and after the reading of each book in the system. Reading Inventory was scored by percent of words correctly read in a whole passage.

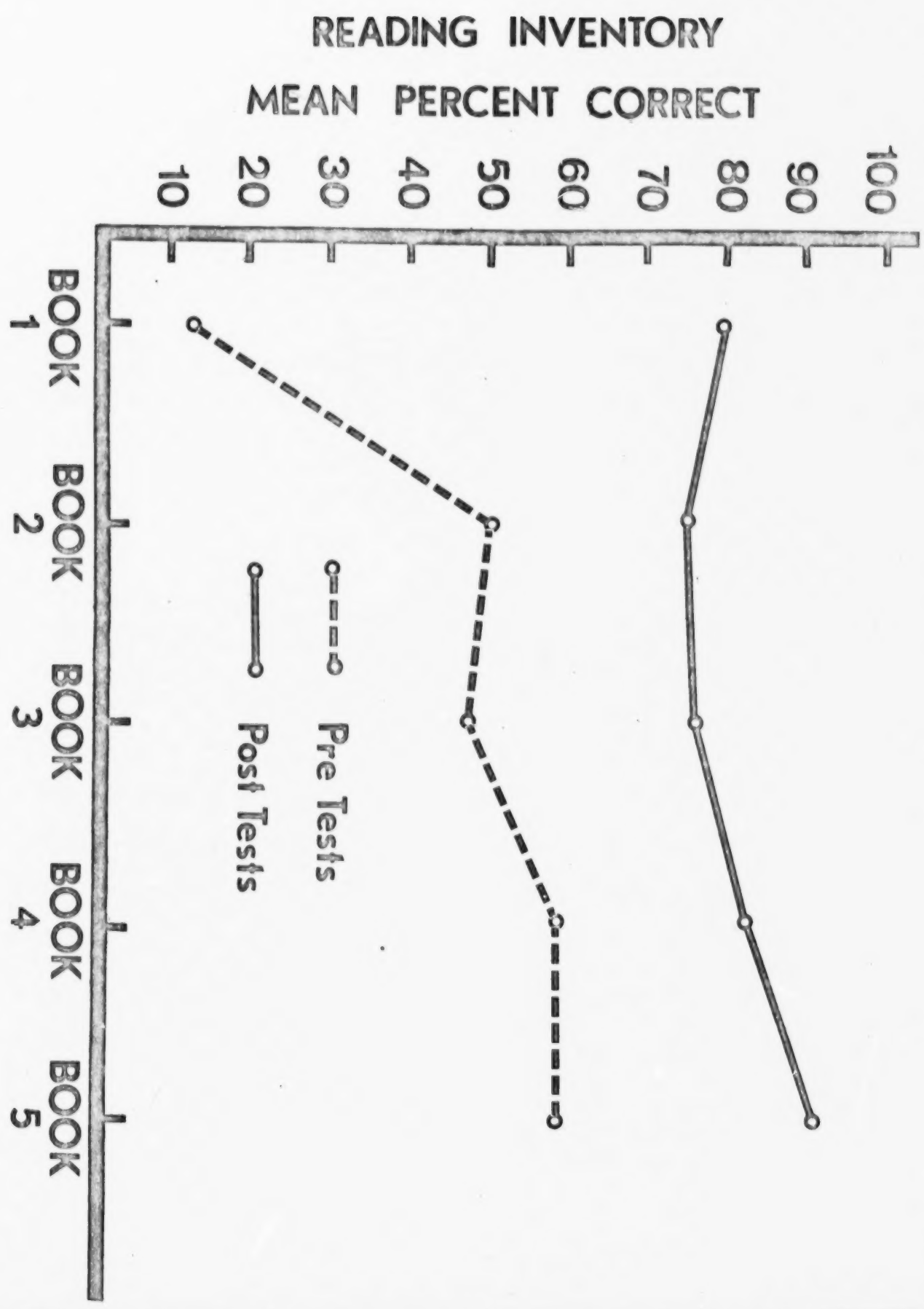
Figure 2


MEAN NUMBER CORRECT
1
2
3
4
5
6
7
8
9
10
11
BOOK 1
BOOK 2
BOOK 3
BOOK 4
BOOK 5
In Context
Out Context

Slide (See Figure 3)

Posttests were significantly higher than pretests for the first three books ($t = 7.22$, $p < .0001$; $t = 2.02$, $p < .05$; $t = 1.90$, $p < .05$). By the fourth and fifth books, pretest performances were so high that posttests were not significantly different. Reading Inventory results show that contextual reading was important even in the first book, as can be seen by the difference in pre to post scores. It is with the very first book that subjects change from non-readers to readers. With each successive book the general trend was improvement in both pre and post scores, despite increasing difficulty.

Figure 3


READING INVENTORY
MEAN PERCENT CORRECT
10
20
30
40
50
60
70
80
90
100
BOOK 1
BOOK 2
BOOK 3
BOOK 4
BOOK 5
Pre Tests
Post Tests

RESULTS FROM TEACHING THE FULLER READING SYSTEM TO THOSE WITH LOW COMPREHENSION EXPECTATION *

PART II

Joyce Blair Shuman

The previous report discussed results based on the reading of:

1. Word lists.
2. Sentences.
3. Paragraphs.

This paper will discuss results from:

4. Daily rating sheets.
5. Vocabulary definition tests.
6. IQ tests.

Records of every reading lesson were kept on daily rating sheets. Included on the daily rating sheets were: words recognized by sight, words sounded out independently, the extent of comprehension, independent verbalizations about the stories, and the amount of help needed.

The daily rating sheets show a steady growth in total number of sight words, ranging from 75 to 650 after an average of one year on the Fuller System. Ability to sound out words independently showed a gradual increase, and then a sudden spurt for each subject as he mastered the game of building up words from letter sounds. After reaching this stage, the number of words sounded out was limitless.

The daily rating sheets also provided an indication of the degree

*This paper is part of a symposium "Reading Comprehension and IQ: A Fallacious Correlation?" presented at the American Psychological Association, September 6, Honolulu.

of comprehension of the material just read. Comprehension, measured by the amount of help needed and independent verbalizations, existed even when the subjects knew only a few words. As the stories became more difficult, understanding grew with them. Independent verbalizations about the stories showed understanding far above mental age expectations.

Examples of spontaneous original remarks made by subjects while reading the books:

"If you've got even more than trillions, maybe it's 'quillions'."

". . . the sun machine feels hot, it's 'cause of the radiation."

"Top-notch means the best in your profession."

"They're measuring all the Voodoos, to be sure they're all the same. But one of them gets bigger and bigger until he almost busts. Or maybe he just expands, that's all."

"Lumpy-bumpy Voodoo speed is about 3 to 5 miles per hour. Top Voodoo speed is about 60 to 80 miles per hour."

The highest ratings and best comments were independent of IQ. The comprehension ratings on the daily rating sheet show that high-level independent verbalizations about the stories need not be correlated with IQ. In other words, the results were not IQ bound.

The second set of results to be discussed in this paper are from the Vocabulary tests. Vocabulary tests were high-level comprehension tests, requiring definitions of difficult words from each book. Tests were given before and after the reading of each book in the series. Responses were scored on a 2-point system similar to the WAIS Vocabulary subtest:

1 point = examples, not elaborated; minor features of an object; or correct usage in a sentence, not elaborated.

2 points = a synonym; examples with elaboration; classification; or a definition.

A few examples of words from each Vocabulary test are:

Book 1 - ELECTRIC, MARS, ANTENNA, PLANET, ROCKET, EVIL, BLAST-OFF.

Book 2 - HAVOC, SATURN, MATTER TRANSMITTER.

Book 3 - COMMANDER, FANTASTIC, CONQUER.

Book 4 - MACHINE, GREEDY.

Book 5 - POETRY, TERROR.

Using standard readability formulas, these words surpass the MA level of all our subjects. Comparis n with Binet, WAIS, and WISC Vocabulary subtests also places the Fuller vocabulary above the MAs of the subjects. But even on pretests all subjects showed an unexpected grasp of the difficult vocabulary of the reading series. The degree of success on pretest vocabulary is unexpected, after our subjects' failure with Binet and Wechsler Vocabulary tests. Apparently, the difficult Fuller vocabulary has a "now" quality that makes these words easier to understand and define than the frequently simpler words of the vocabulary lists in our IQ tests. This success on the difficult Fuller vocabulary presumably reflects our 20th century, TV and space age.

As can be seen from the graph of Vocabulary test results, there

Slide (See Figure 4)

was an improvement from pretest to posttest for each book. For books 1 through 4, these differences were significant ($t = 2.33$, $p < .025$; $t = 1.91$, $p < .05$; $t = 1.91$, $p < .05$; $t = 2.05$, $p < .05$). The difference between pre and posttests for Book 5 does not reach significance. The increasing ability to define words may reflect changes in the thought processes as a result of reading. Vocabulary definitions tap far more than simple recall of factual material.

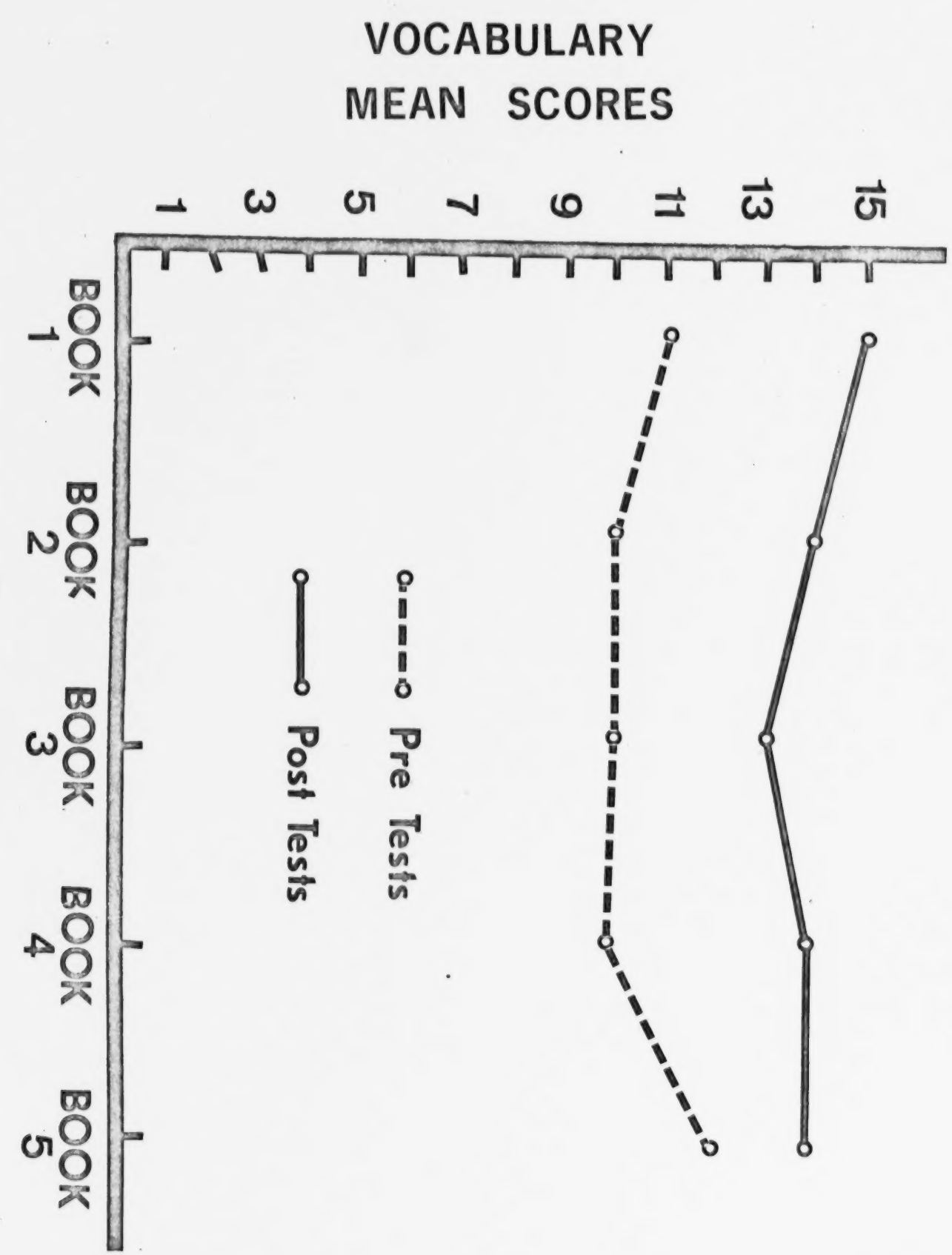
On the Vocabulary tests, it was not always the subjects with IQs in the 60s who performed best. The highest vocabulary posttest score obtained for Book 5, a difficult and sophisticated book, came from the subject with an IQ of 33; the highest score on Book 2, from one of the 35 IQ subjects; the highest on Book 4, from a 48 IQ. The highest scores for all the Vocabulary tests were from the lowest as well as highest IQs in the group.

The third set of results to be discussed in this paper are from the IQ tests. The type of acute learning disorders of the present study can, perhaps, be best understood visually. The following film shows the type of low IQ subjects being taught to read in the study.

FILM (16mm color, about 3 minutes)

The subjects of the present study exhibited cognitive behavior on a much higher level than expected from their Binet IQs. This raised the question: Did learning to read change the IQs of our subjects? There was, indeed, a highly significant mean increase on the Stanford-

Figure 4


VOCABULARY
MEAN SCORES
1
3
5
7
9
11
13
15
BOOK 1
BOOK 2
BOOK 3
BOOK 4
BOOK 5
Pre Tests
Post Tests

Binet scores of our subjects, 5.5 IQ points ($t = 4.36$ $p < .001$). A five point IQ rise, when the change is from 35 to 40 or from 45 to 50, is much more meaningful and dramatic than if it had been a rise from 100 to 105, even though both are statistically significant.

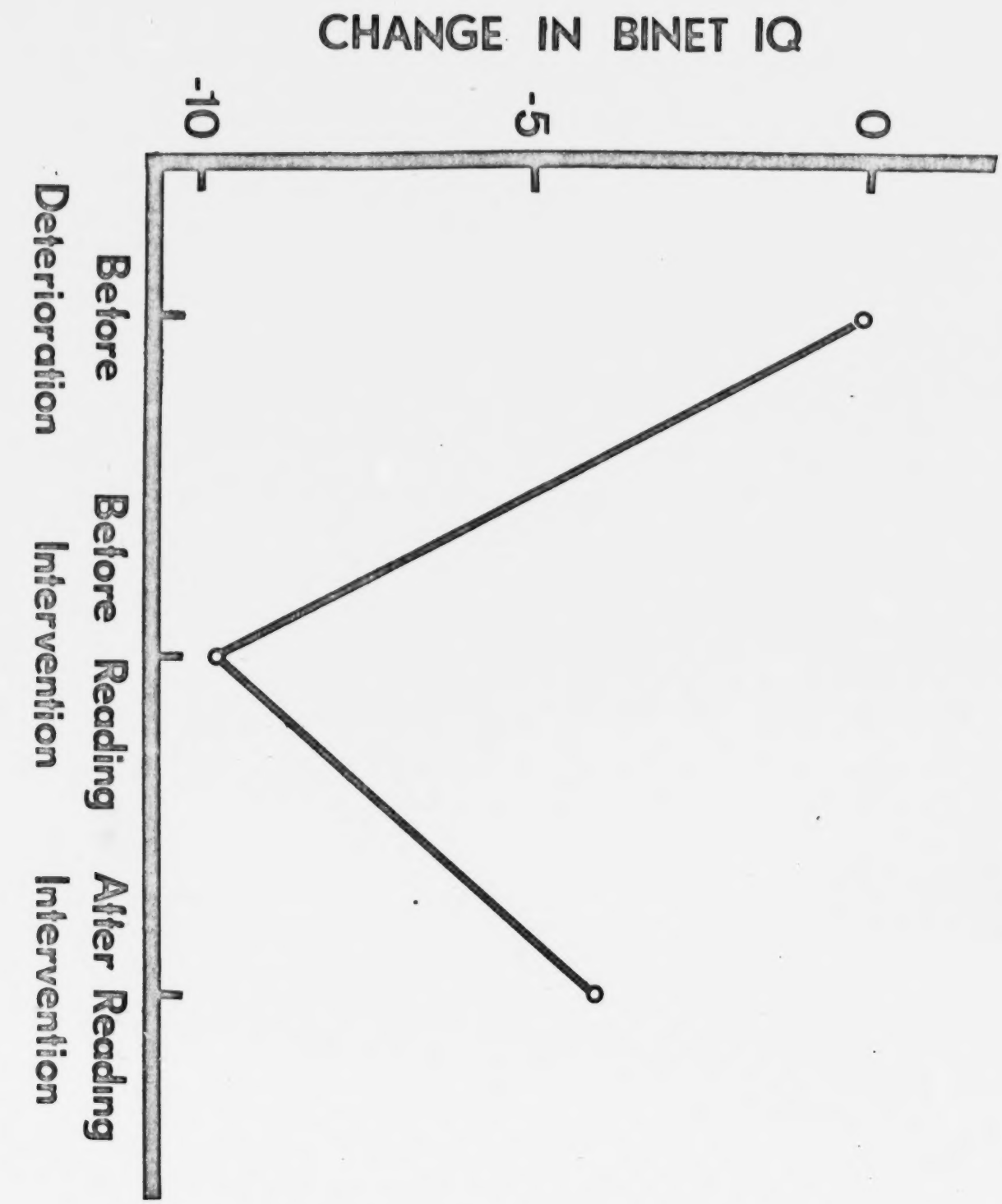
Further, this increase was even more important than is indicated by the statistical significance. The particular group of institutionalized retardates chosen for the present study had shown a downward IQ trend prior to reading intervention. This downward trend is contrary to that generally observed at our institution. A previous study (Lutkus & Fuller, in press) showed that the IQ trend in our institution is positive, with an average increment of 4 points. Inadvertantly, in an attempt to choose the most acute learning disorders to test the Fuller Reading System, we chose a sample with an IQ trend opposite from the rest of the institution. Hospital records of Binets and WISCs administered within the past 10 years to subjects with CAs over 5 years showed that, despite extensive school and work programs of the hospital, the IQs of our group of subjects had dropped an average of 9.8 points. Reading intervention reversed the downward trend.

Here is the graph of IQ results:

Slide (See Figure 5)

In Figure 5, the former downward trend of our subjects can be seen, as well as the reversal of the trend and the significant IQ gains after

Figure 5


CHANGE IN BINET IQ
-10
-5
0
Before Deterioration
Before Intervention
Before Reading
After Reading
Intervention

reading intervention. All our subjects except one showed an increase in IQ. The one case who did not show an IQ increase is now an extremely successful reader (fourth grade level) in spite of an IQ of 35.

It appears that reading intervention can produce general changes, IQ gains, as well as specific changes in reading performance. The findings are especially unexpected when one considers that the present study is dealing with mentally handicapped subjects with hard-core learning disorders.

A NEW THEORY OF INTELLIGENCE WHICH ALLOWS READING WITH COMPREHENSION IN LOW IQ SUBJECTS *

Renée Fuller, Ph. D.

With this new system we have broken through the difficulty of reading mechanics. We have seen something we did not expect; that once mastery of the mechanics is achieved, reading with comprehension of fast-moving action stories is an easy and fun task for even very low IQ subjects.

Our results raise some curious questions about what is intelligence. For if IQs in the low 30s can read with comprehension, then how do we define intelligence? Reading comprehension and IQ are two concepts so tightly linked, that their high positive correlation has been a basic assumption in psychology as well as in education. But the results shown in the two preceding papers question the validity of this assumption.

Although there has been extensive controversy about IQ, few people have questioned the capacity of IQ tests to predict school performance. What we have found is that the standard Binet and Wechsler scores have little predictive value for the new reading system. Our data, therefore, unintentionally challenge the concept of intelligence advanced by Jensen, Herrnstein, and Shockley. Our results indicate that such a concept of intelligence may not be appropriate to the real world.

*This paper is part of a symposium "Reading Comprehension and IQ: A Fallacious Correlation?" presented at the American Psychological Association, September 6, Honolulu.

Because we found reading with comprehension in subjects with IQs in the 30s, the Binet IQs of these subjects have failed in their predictive function. Because we also found changes in measured IQ in most of these subjects after they had been taught to read, we have also shown that IQs need not be stable and definitive. The changes in the patterning of Binet subtests found in many of our subjects may indicate that abilities in one area of cognitive functioning can compensate for weaknesses in another. If this is the case, then our data question the unitary concept of intelligence.

If Binet IQs primarily measure Spearman's g, or general intelligence, then our low IQ subjects are remarkably deficient in general intelligence. Such deficiency in general intelligence should preclude reading success. But our subjects were successful. For this reason, our results raise questions about the validity and meaningfulness of Spearman's g in the real world. Spearman's g is a statistical abstraction - an abstraction that may adequately describe a large population, but one that can fail to describe individuals within that population. If results from individuals are pooled, intellectual abilities show high intercorrelations. It is the high intercorrelation of abilities that has produced the concept of general intelligence. However, for individuals, contrary to pooled data, the intercorrelation of abilities can be low. Statistically, individuals with uneven test performances balance each other out, thereby producing the abstraction of general intelligence. Since those with uneven performances do not fit the theoretical norm,

these individuals are often labelled "brain damaged". A theory that labels so many organisms that do not fit it as damaged has weaknesses in its own right. The label of "brain damage" had been an effective way of ignoring some intelligence data.

The concept of Spearman's g failed with our sample. Our subjects, despite their poor test performance and acute learning disabilities, nevertheless showed that they had abilities that could be utilized. Rather than drilling these subjects in deficient areas, the new system with its varied approaches allowed abilities in one area of functioning to compensate for weaknesses in another.

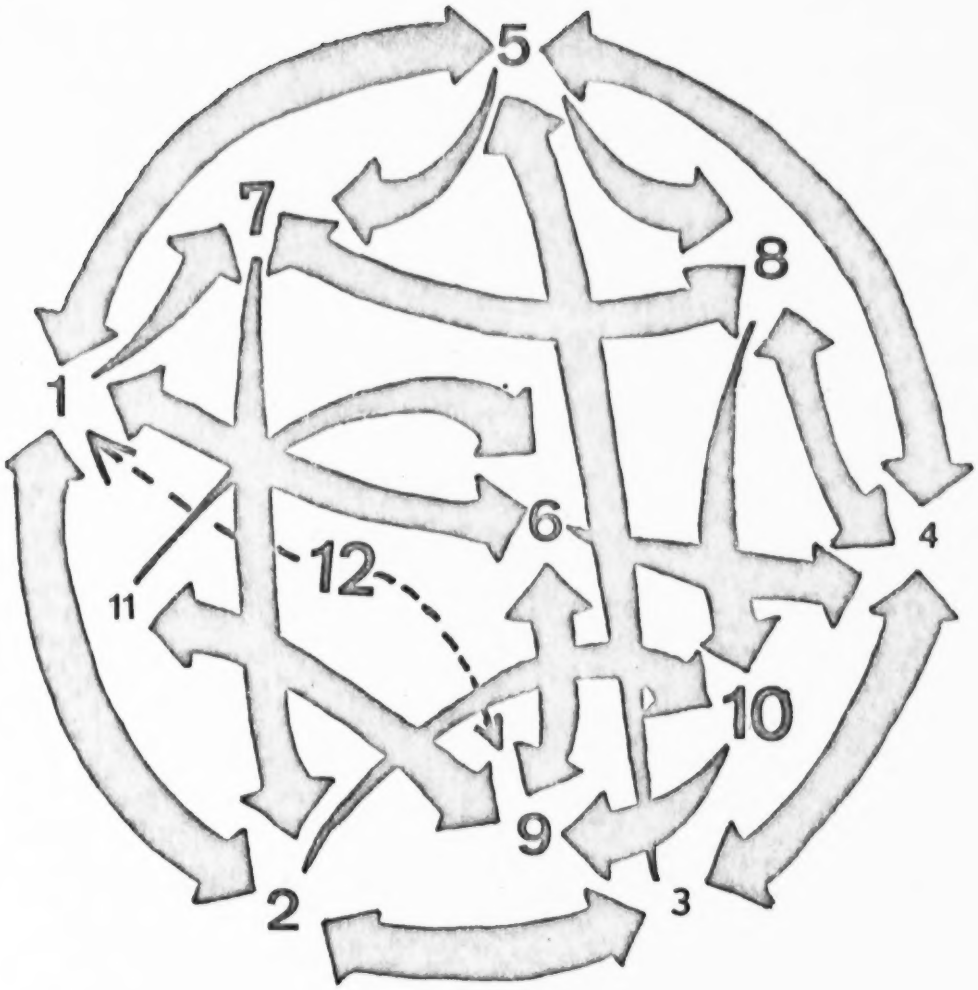
Our data make more sense if intelligence is viewed factor-analytically. Factor analysis avoids the problem raised by low intercorrelation of abilities. Because factor analysis quantifies various aspects of intellectual functioning, it is possible to profile these abilities. But even factor analytic theorists of intelligence make the assumption that abilities remain constant. It is the lack of constancy of abilities and of their profiles that our results have raised.

I would like to present an alternative conceptualization which regards intellectual functioning as a living system. I would like to add to the concept of factor analysis and the concept of interrelated abilities, the concept that these abilities are not immutable. Our theories of intelligence must account for the fact that capacity

for change is one of the most important aspects of intellectual functioning. Further, capacity for change may vary from person to person depending on the original pattern of abilities as well as on the skill of environmental intervention. Conceptualizing intelligence in this way would explain why we find that learning deficits in children sometimes disappeared in adulthood. Viewing intelligence as a living system can lead to a developmental theory of intelligence.

An analogy from chemistry may be appropriate. Chemistry also started with the concept of one-to-one relationships. But with the advancement of its science, it developed a Krebs cycle, which is a circular interlocking feedback relationship. In the Krebs cycle, the different chemical units are in continual living interaction with one another. Intelligence may be similar. (Figure 6) But individual intellectual abilities are even more variable than the chemicals involved in the homeostatic Krebs cycle. For this reason, the interaction of intellectual abilities becomes more complicated than the already complicated Krebs cycle. And, whereas, in a homeostatic chemical relationship, the system works to maintain equilibrium, the intellectual system seeks optimal performance rather than maintenance of a status quo.

The results of the present study have shown that environmental input, especially if it is literate, can alter the expectations of in-



INTELLIGENCE

Figure 6

tellectual functioning. Conceptualizing intellectual functioning as a reflection of numerous abilities in living interaction with one another, makes it possible not only to explain data, but also to suggest the possibilities for and types of intervention. This conceptualization of intelligence has theoretical utility in that it can explain contradictory observations; it has applied utility because it suggests how to write prescriptions for learning. Application of the theory allows us to design educational systems which allow abilities in one area to compensate for weaknesses in another. Such an approach is different from one which practices a student in his weaknesses to bring him up to a theoretical norm. The practice of weaknesses may mean repeated exposure to failure. Failure experiences can be more effective than punishment in turning students off.

Suggesting a different conceptualization of intelligence does not imply that IQ tests lack predictive validity with reference to school performance. IQ tests do predict school performance, especially in schools as they are now constituted. That they failed in their predictive validity with reference to our subjects indicates the tight linkage between IQ tests and the present educational system. Because IQ tests were designed to measure aspects of cognitive functioning important for school success, IQ tests are by their very nature descriptive of the educational system. The most frequently used tests place a heavy emphasis on memory of visual nonsense material, auditory nonsense material, verbal nonsense material, and nonverbal

nonsense material. These are items important in the prediction of school success. That so much of school content involves memory of nonsense material is hardly flattering to the school system.

We have shown that an alternative approach is possible. A learning system can emphasize structured content to bring into play a multitude of different intellectual abilities. The previous papers showed that some of these abilities exist even in low IQ subjects. In addition, principles from perceptual and developmental psychology can be used to load the dice for learning. When we do so, IQ tests lose their predictive value as well as their threat.

SUMMARY

Our reading system has shown a way of changing the nature of education. It has also shown that when one does, IQ tests lose their predictive value and reliability. Apparently IQ tests and the educational system are so tightly linked that one is descriptive of the other.

READING COMPREHENSION AND INTELLIGENCE: A FALLACIOUS CORRELATION? *

Discussion of a Symposium presented at APA, Hawaii, September, 1972

Sam Glucksberg, Princeton University.

My comments today fall into two categories. The first is the traditional set of observations, critiques, and reactions to the material presented by the symposium participants. The second is somewhat atypical in this context, yet I feel it is important and appropriate to the issues raised by Dr. Fuller concerning intelligence and intelligence testing. It is also most appropriate to the more general issues raised recently by such writers as Shockley, Jensen, Eysenck and Herrnstein concerning the heritability of intelligence in relation to performance-differences among ethnic, social-class and racial groups. It seems to me that the social, economic and political climate is ripe for a resurgence of race and class biases of the kind so much in evidence in the psychological community during the period from 1900 through the 1930's and expressed so clearly by such writers as Goddard, Brigham, Pintner, McDougall, Dunlap and Yerkes, among others. While the targets (or victims) of these biases have changed, the arguments concerning the unalterable, if unfortunate, inferiority of various ethnic and racial groups have not changed.

To begin with, whatever else one might say about the work of Dr. Fuller and her colleagues, they have a displayed rare common sense remarkably

* I thank L. J. Kamin for much of the historical material on intelligence testing and social policy.

uncontaminated by pseudo-professionalism. We professionals, whether we are experimental psychologists, clinical psychologists, psychometricians--or psychiatrists, social workers or oral surgeons --like to believe that we possess a set of hard-earned and difficult-to-acquire skills which, coupled with native talents and abilities, enable just we select few to accomplish what we claim to be able to do. Our skills are special and esoteric, and they are simply not available to the non-initiates--- certainly not without the special and arduous training we endured. After all, if anyone can do it, where is the joy and pride in my being able to do it. As Gilbert & Sullivan point out in the Gondoliers, "when everybody's somebody...then no one's anybody."

It is pleasantly surprising to learn that the Fuller methods do not require the services of a certified "professional", in the same way that one is always greatly relieved to learn that a particular experimental finding is not dependent upon the age, sex or temperament of the experimenter. It also speaks well of the working relationships in Dr. Fuller's clinic where all the people involved --technicians, secretaries, testers --participate fully in the psychology program. It gives one hope that perhaps even departmental chairmen and academic deans might someday find useful employment!

It is also good to know that the effectiveness of the program is not dependent upon the particular person involved in teaching. This leaves us free to wonder about the necessary and sufficient elements, or patterning of elements, which are responsible for the apparent success. Let me list

what I take to be important aspects of the program.

First, the way the alphabet is taught strikes me as eminently sensible in a number of important ways. The "distinctive feature" approach in itself is not particularly innovative. What is innovative are the distinctive features of Fuller's use of this approach both in her particular choice of distinctive features to work with, and in her choice of teaching techniques.

The three "features" are line, circle and angle. I suspect that these three features worked for several reasons. First and most obviously, they are sufficient to generate all the letters of the alphabet. Second, they are highly discriminable and were given discriminable and familiar names: stick, ball and bird. I should like to point out that one might have chosen just two distinctive features: line and circle. In this case, angle would be two lines (or bird would be two sticks). Beyond the two geometric classes of straight and curved lines, the number, character, and names for distinctive features are arbitrary. Fuller's choice of these three seems to have been a wise one...whether they are optimal for her population and for a non-institionalized population as well is an interesting question for future research.

Mrs. Schmell has noted some aspects of the methods used...among them color-coding and involvement of four sensory modalities. Here, as in most educationally relevant areas, the psychology laboratory provides only ambiguous guidance. Color coding here would be classified as a redundant cue, and our best data tell us that redundant cues need not be particularly effective in learning situations. Similarly, involving more than one modality, like vision and audition, also has minimal effects in the laboratory. Are

these aspects of the method important? I suspect strongly that they are, and if this turns out to be the case, we should look very carefully at our laboratory techniques from the point of view of how we go about representing aspects of the real world in our experimental designs.

One aspect of the method which does derive from the laboratory is the particular choice of labels, or names, for the three features... stick, ball and bird. We do know, with some degree of confidence, that concrete and familiar material is learned more easily than abstract and unfamiliar material. One would also expect that such material would be easily learned on the basis of Piaget's concept of assimilation.

In short, the decisions made by Fuller and her associates seem, in retrospect, to have been the "right" ones, and these decisions involved choices of psychological data and theory. Even the decision to ignore the names of letters and to label them with their most frequent acoustic coding represents a strategic choice... it is obvious in hindsight that learning one thing is usually easier than learning two things.

But enough...I'm here to question, not merely to praise, even though in the light of the accomplishment one feels rather petty in raising questions that might be of only academic or socio-political interest.

It seems to me that the next steps to be taken should be in the interest of analysis. Why and how does this system work as well as it seems to? Is it applicable, with or without modification, to other populations? What modifications, if needed, should be made? For example, is individualized instruction a necessary element? How important for the success of the method are the content and format of the stories? Is

color coding, as many laboratory studies suggest, merely redundant? Questions like these have two purposes. The first, and the more immediately important purpose, is to maximize the probabilities that a method like this will be adopted where appropriate. The simpler and less costly the system, the more likely will it be adopted. The second goal, and important in the long run, is some understanding of the nature of reading behavior and reading skills in general. Fuller's work in this context is analogous to Rozin and Gleitman's efforts in Philadelphia. First, get a clear and unambiguous effect. Then ask...what happened and why? In the Fuller work we have an effect...how and why will be very useful questions to pursue.

I would now like to raise some questions about the effects reported. First, what other effects has the program had other than those reported? I would be most interested in knowing whether there were any effects on such aspects of a patient's life as his self-image, his emotional states, his general competence as a functioning human being. It is all well and good to be able to read at, say, a third grade level. Does this do him any good? Perhaps Dr. Fuller has some observations on this point. I would also like to know the likelihood of the people in her sample reading material other than the books provided, and do they read outside the clinic, on their own, without a teacher present? Do they read comics, other children's books, or magazines? Do they read signs and labels? Has reading become for them a relatively every day, automatic activity? These are but a few of the questions one might ask concerning the full effects of the reading program described here.

A second kind of question goes beyond this immediate situation. How much of an effect do we really have here? I am not referring now to the data reported this morning, nor to the potential answers to the questions I have just raised about the nature and magnitude of some side-effects of the program. Instead, I am turning to the context of these data, and to the source of our sense of surprise and amazement that people with measured IQ's in the 30's...to say nothing of 60's, 50's and 40's, could perform in such apparently complex tasks...and even that these people have complex feelings and emotions which they express rather well. I must confess my own sense of dissonance - a person with measured IQ of 33 reading? Understanding? - which betrays my own unreasoned and unexamined belief in the predictive validity of IQ scores.

This brings me to the second category of remarks...the implications of the traditional American view of IQ as a measure of something (namely, intelligence) that is

(a) fixed;

(b) predictive of other measures, including school grades and economic success;

(c) innate, i.e., determined primarily by genetic factors and relatively independent of experience and education.

While these three characteristics of intelligence and the beliefs about them are conceptually independent, they tend to cluster together. A fourth factor also tends to cluster with these three, the belief in socio-economic, national, ethnic, and racial group differences in intellectual abilities. And finally, a fifth belief or conviction enters into the picture. If all four beliefs are

held strongly, then they lead to the unwarranted inference that there is no purpose whatever in trying to change people in this respect. Benevolent neglect is justified by the belief that whatever we may try, we will fail. Dr. Fuller's results should, at the very least, lead us to question policy decisions based upon beliefs that particular groups of people would not profit from suitably designed programs of training and education. Could it be that Professor Jensen's views on the potential variability of IQ and its consequences for scholastic achievement are too pessimistic?

However, doing nothing, harmful though that may be, is but the least of the consequences of the general view that we can measure a fixed, genetically determinable quality called intelligence. I'd like to consider some of the consequences for social policy that the fixed-quantity view of intellectual capacity had at an earlier time in this country and some of the potential dangers that might arise from this view right now. Binet was crystal clear on both the nature and purposes of his tests, and on the uses to which they were soon to be put:

> "... some recent philosophers appear to have given their moral support to the deplorable verdict that the intelligence of an individual is a fixed quantity... We must protest and act against this brutal pessimism..." (1909).

The purpose of testing, for Binet, was <u>not</u> merely to predict, and not merely to screen or place people into various levels of society. The purpose was to <u>diagnose</u>.. and then to <u>prescribe</u>. Again, to quote Binet, "After the illness, the treatment".

Unfortunately, this point of view did not characterize the intelligence testing movement in the United States, nor the uses to which intelligence testing were put. Goddard, in 1913, went to Ellis Island in New York to sample and test the "great mass of average immigrants" and concluded that 83% of Jews, 80% of Hungarians, 70% of Italians and 87% of Russians who immigrated to our fair shores were feeble-minded... not just below average mind you, but feeble-minded. Since IQ is fixed and inherited, what to do? Pintner, in 1923, is clear on at least one course of action:

> "It would be well...to emphasize the intelligence factor in the selection of our immigrants...lest the whole nation be diluted with stocks of inferior mentality.." (p. 361).

Who were these stocks? Southern and Eastern Europeans, notably Italians, Poles, Russians, and Hebrews. These conclusions were drawn and/or endorsed by such notables as Carl Brigham, William Mc Dougal and Robert Yerkes. With respect to these Hebrews, one Mr. Kinnicutt testifying before a Senate Committee hearing on immigration in 1923 adds his own comment: "some of their labor unions are among the most radical in the whole country".

This seems a peculiar comment indeed about a group of whom 80% are feeble-minded!

Immigration laws were, of course, passed; and congruent with Pintner"s views in the 1923 Journal of Experimental Psychology, selective immigration policies for future immigrants were soon to be supplemented by "... a more vigorous method of dealing with the defective strains already in the country". Sterilization laws were passed in 31 states.

By 1935 it was still claimed that 70% of Poles, Italians and Russians in the U. S. were mentally defective (JASP, 1935). Have things changed since then? In some respects, of course, they have. Jews, Russians, Poles and Italians are no longer the overt targets. But some beliefs have not changed. In 1921, Dr. Arthur Sweeney testified before a congressional committee

> "...it is as easy to calculate one's mental equipment as it is to measure his height and weight...there is little controversy as to its reliability and efficiency". In 1971, Professor Richard Herrnstein writes "The measurement of intelligence is psychology's most telling accomplishment to date...nowhere else...has there arisen so potent an instrument as the objective measure of intelligence".

In view of the apparent impact of intelligence testing on the laws enacted by federal and state governments, one must agree with Professor Herrnstein's assessment of the potency of intelligence testing: Other parallels between then and now disturb me. Chester Carlisle, Director of the Bureau of Analysis and Investigation, State Board of Charities, New York State, in 1918:

> "Those lacking in intelligence capacity drift into the lower levels of our social life and come to be the denizens of city slums...the residue which remains is..composed of those of least social value... Hence, their progeny show more and more evidence...of gross intelligence defect...'pauper', dreaded word in every land, has epitomized the dregs of failure."

In 1971, an echo from the past by Professor Herrnstein: "As the wealth and complexity of human society grow, there will be precipitated out of mankind a low-capacity...residue that may be unable to master the common occupations...and are most likely to be born to parents who have similarly failed..."

I do not intend to cast these men as villains. Their respective views arise inevitably out of their beliefs about the nature of intelligence. However, after half a century, it surprises me that we still have no strong evidence, as Herrnstein aptly points out: "Although there are scraps of evidence for a genetic component in the black-white difference...a neutral commentator..would have to say that the case is simply not settled, given our present state of knowledge".

One is faced, I think, with one or another point of view as a tenet of faith...as a philosophy, if you will. I do not doubt the potential and variable heritability of any number of human characteristics...Sandra Scarr-Salapatek's analysis is very clear on this point. I also have no doubts on the potential utility of two alternative courses of action. Searching for non-diagnostic tests of mental ability has occupied many people for a long time, with precious little that is good to show for it. Work of the kind we have heard about today, in sharp contrast, has important social and practical implications. Important as these might be, we should not overlook its theoretical implications, nor its implications for the direction of future research. How much longer will we lay the blame for our own scientific, professional and societal inadequacies upon our children...or, even worse, the children of our neighbors?

CONCLUDING REMARKS

Judy F. Rosenblith, Ph. D.

In conclusion, I want to underline a point which was made by Dr. Glucksberg in his discussion. There were so many interesting considerations that he raised that it may not be amiss to return to this one and stress it.

Any experimental psychologist who studies the data on the results obtained by Fuller's reading system will want some way of separating out the effects of the two large departures from traditional reading systems that she makes. On the one hand there is the method of teaching the letters which is unique, and on the other there is the content of the readers which is also very different from the usual. It is very much to be hoped that she, or others working with her cooperation, will soon do experiments, both with normal children and with populations of retarded subjects similar to hers, that will enable the assessment of the separate contributions of these two departures.